Remarks

Claims 84-140 are pending in the Application.

Claims 103-108, and 114-140 are cancelled herein without prejudice.

Claims 84-103 and 109-113 stand rejected.

Claims 97-102 are amended herein.

Claims 141-144 have been added herein.

I. RESTRICTION UNDER 35 U.S.C. § 121

Examiner has restricted Claims into five Groups. Applicant has elected, without traverse Group I, claims 84-103 and 109-113 in Paper 9. Claims 104-108 and 114-140 are withdrawn from consideration and have been cancelled herein without prejudice.

II. REJECTIONS UNDER 35 U.S.C. § 102

Examiner has rejected Claims 84-90, 92-94 and 97-103 under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over *Kiang et al.*, "Structural Modification of Single-Layer Carbon Nanotubes with an Electron Beam," Journal of Physical Chemistry, Vol. 100, no. 9, pp. 3749-3752, 1996 ("*Kiang*"). Office Action at 2.

Examiner contends that *Kiang* teaches "that single-walled nanotubes tend to stick together in parallel bundles, which are woven together to give a carbon net, or mat, giving rise to a soot with a rubbery texture", and "the sonication of these samples in ethanol and the depositing of the suspension onto a grid." Office Action at 2. Examiner contends regarding claims 84-90 and 92-94 that, although nanotube cutting and untangling are not explicitly taught, it is expected that this would occur. Examiner further contends that "*Kiang* does not explicitly teach the lengths of the carbon nanotubes after sonication treatment...however, it is

expected that at least some of the nanotubes have lengths within the claimed range." Office Action at 2-3.

Examiner is reminded that, for a claim to be anticipated under § 102, *each and every element* of the claim must be found within the cited prior art reference.

Claims 84-85. With regard to Claim 84 and 85, Applicant notes that *Kiang* shows that under electron-beam heating, "Occasionally the tubes were fragmented into sections, as in the tube in Figure 5..." (*Kiang* p. 3750, col. 2, par. 2). The two tubes shown in Figure 5 of *Kiang* are no more and no less tangled than they were prior to their fragmentation. *Kiang* neither demonstrates nor claims "untangling" of nanotubes. Further, *Kiang* does not in any way recover the single-wall carbon nanotubes un-tangled by the cutting step as is set forth in Claim 84.

Although *Kiang* does cite sonicating nanotubes in ethanol, there is no mention of cutting the nanotubes by sonication. The sonication in *Kiang* appears to have been to prepare a suspension of the nanotubes for dropping onto a support grid for microscopic analysis. Furthermore. Applicant notes that in cutting by sonication, sufficient energy input and sufficient time must be used in order to cut the nanotubes. *See* Application, page 31, *ll.* 22-24. *Kiang* sonicates a mixture comprising nanotubes but does not speak to the energy input and times used, and does not teach cutting carbon nanotubes by means of sonication. Therefore, Kiang cannot be anticipatory Claims 84 and 85.

Claims 86-88. Claims 86-88 depend from Claim 84 and relate to the length of shortened single-wall carbon nanotubes in the recovered material of claim 84.c). *Kiang* does not teach recovery of a material comprising untangled nanotubes (as required by Claim 84), nor does it teach anything about the properties of such a material. Therefore, Kiang cannot be anticipatory of Claims 86-88.

Claims 89-90 and 92. Claims 89-90 and 92 depend from Claim 84 with the additional step of forming a suspension of the tangled single-wall carbon nanotubes. While *Kiang* teaches forming a suspension of tangled single-wall carbon nanotubes, Kiang does not teach such formation in addition to the other limitations in Claim 84, specifically, cutting to un-

tangle the nanotubes and recovering un-tangled nanotubes, and cannot, therefore, be said to be anticipated by *Kiang*.

Claim 93. Claim 93 depends on Claim 84, further limiting the forms of tangled single- wall carbon nanotubes to ropes and mats. *Kiang* does not speak to ropes or mats, and does not combine anything that could be construed as ropes or mats in any process having all the limitations of Claim 84. Correspondingly, Claim 93 is not anticipated by *Kiang*.

Claim 94. Claim 94 further limits Claim 84 requiring dispersion of the tangled form of single-wall carbon nanotubes in an aqueous detergent solution or organic solvent. *Kiang* does not teach methods with the limitations of Claim 84 in addition to dispersion of carbon nanotubes. Correspondingly, Claim 94 is not anticipated by *Kiang*.

Claims 97-103. Claims 97-102, have been amended herein. Claim 103 has been cancelled.

Applicant has amended Claim 97 to speak to a process in which defects are exploited to sever the nanotubes. Support for such amending can be found in the Application on page 31, *ll.* 11-14 which states, "The SWNTs may also be cut into shorter tubular molecules by intentionally incorporating defect-producing atoms into the structure of the SWNT during production. These defects can be exploited chemically (e.g., oxidatively attacked) to cut the SWNT into smaller pieces." And, Application, page 31, *ll.* 27-30 states, "In another embodiment, sonification [sic] may be used to create defects along the rope lengths, either by the high temperatures and pressures created in bubble collapse (-5000°C and ~ 1000 atm), or by the attack of free radicals produced by sonochemistry."

Claim 98 has been amended with regard to cutting by sonication to require "sonication of a suspension of single-wall carbon nanotubes at a sufficient energy input and for a sufficient time." Support for this amending is found in the Application on page 31, *ll.* 22-24. Dependent Claims 143 and 144 referring to sufficient energy input and sufficient time have been added. Dependent Claim 143 includes "wherein the sufficient energy input comprises a frequency of about 40 KHz and a power output of about 20 W." Support for this Claim is found in the Application on page 31, *ll.* 21-22. Dependent Claim 144 includes

"wherein the sufficient time is in a range of about 10 minutes and about 24 hours." Support for this Claim is found in the Application on page 31, *ll.* 24-26.

Claim 99 has been amended merely to clarify that the refluxing of Claim 98 is *done* in concentrated nitric acid. No new matter is added by this amending.

Regarding Claims 97-99, Examiner contends that "*Kiang* teaches the process of electron beam irradiation", and "that under intense electron beam heating, the nanotubes are broken, or cut." Office Action at 3. As noted above, Applicant has amended Claim 97 to require exploitation of defects in the cutting process. As *Kiang* does not teach cutting via defect exploitation, or any process that attacks these defects to effect cutting of the nanotubes, amended Claim 97 cannot be said to be anticipated by *Kiang*. As Claims 98 and 99 depend from amended Claim 97 and also possess this feature, they too are not anticipated by *Kiang* for the same reasons as amended Claim 97. Additionally, Claim 98 has been amended to eliminate electron beam cutting as a means of cutting single-wall carbon nanotubes—further differentiating it from the teachings of *Kiang*.

Claims 100 and 101 have been amended to add a step wherein defects are introduced (amended Claim 100), and wherein they are introduced during the manufacturing process (amended Claim 101). Support for such amending can be found in the Application on page 31, *ll.* 11-14 which states, "The SWNTs may also be cut into shorter tubular molecules by intentionally incorporating defect-producing atoms into the structure of the SWNT during production."

Claim 102 has been amended to further refine the Markush listing of techniques by which defects can be introduced into single-wall carbon nanotubes. Electron beam cutting has been eliminated from the original listing. The addition of "high temperatures" in place of "heat" and the addition of oxidation, oxidative etching, and refluxing, all find support in the Application on pages 31 and 32, and do not represent the addition of new matter.

Regarding Examiner's rejection of Claims 100-103, amended Claims 100 and 101 depend directly or indirectly from Claim 97, and include all of the features of Claim 97 including cutting by defect exploitation, and cannot, therefore be anticipated by *Kiang* for the

same reasons as Claim 97. Furthermore, amended Claim 102, which is ultimately dependent on Claim 97, cites introducing defects by various specific means, none of which are spoken to in *Kiang*.

Regarding Examiners rejection of Claims 97-99 and 100-103, *Kiang* does not speak to use of defects to enable cutting (cutting via defect exploitation). *Kiang* further does not address introduction of defects by electron irradiation, conversely, he speaks to "patching" of defects by the action of the electron beam (*Kiang*, p. 3751 col. 1, par. 2), and goes on to teach away from defect creation by electrons saying that "under appropriate conditions the defects in the tubes might be repaired by a suitable dose of irradiation, possibly strengthening the materials" (*Kiang*, p. 3751 col. 2, par. 3).

Further in regard to Claims 97-99 and 100-103, Examiner further contends that "while not explicitly taught, sonication may additionally cause defects, it is expected that this be the case, due to the forces that act upon the nanotubes during the sonication process." Office Action at 3.

Again, *Kiang* makes no mention of causing defects in the nanotubes by sonication. The sonication in *Kiang* appears to have been to prepare a suspension of the nanotubes for dropping onto a support grid for microscopic analysis. *Kiang* does not anticipate or suggest that sonication could cause defects in or modify the nanotubes.

As disclosed in the present Application, under certain conditions, however, sonication can create defects in the nanotubes. In fact, Applicant admits "In another embodiment, sonification [sic] may be used to create defects along the rope lengths..." (See Application, page 31, *ll.* 27-30.) However, such sonication processes require sufficient energy input for sufficient time.

Accordingly, Applicant respectfully requests that the Examiner consider Applicant's amendments and arguments and withdraw all outstanding rejections under 35 U.S.C. §102(b).

III. REJECTIONS UNDER 35 U.S.C. § 103(a) OVER *KIANG*

Examiner has rejected Claims 84-90, 92-94 and 97-103 under 35 U.S.C. § 103(a) as being obvious over *Kiang*. Office Action at 2.

As a preliminary point pertaining to this §103(a) rejection, Examiner is relying on *Kiang* and, a possible inherent property or function for this obviousness rejection. The Examiner contends "Where, as here, the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention, the burden of proof is shifted to the applicant, as in *In re* Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980.)" Office Action at 3.

Regarding inherency, *see* also *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991). A prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference. For inherency to be shown, extrinsic evidence must be presented that makes "clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Id.*, 948 F.2d 1264, 1268, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991) Inherency cannot be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is legally insufficient. *Id.*, 948 F.2d at 1269, 20 U.S.P.Q.2d at 1749.

Examiner is reminded that, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found

in the prior art and not based on applicant's disclosure. *See* M.P.E.P. 706.02(j); *see also In re Vaeck,* 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Examiner contends regarding Claims 84-90, and 92-94, that although "it is not explicitly taught [in *Kiang*] that the nanotubes are cut and untangled, however, it is expected that this occur because no difference is seen between the process of *Kiang et al.* and that of the instantly claimed invention." Office Action at 2-3.

Claim 84 incorporates the limitations of untangling and recovering untangled carbon nanotubes. *Kiang* does not teach or suggest these limitations, and expectation of their success is not apparent in prior art. One skilled in the art would know that electron beams of the type used by Kiang to damage nanotubes would have had a power density in excess of 100,000 watts per square centimeter. Figure 5 of *Kiang* shows that the nanotube fragments remain affixed to their neighbor after the fragmentation process: there is no untangling and no recovery of untangled carbon nanotubes. The display of Figure 5 substantiates the widely-held belief at the time of *Kiang* that Van der Waals forces are extremely effective in binding carbon nanotubes together; the nanotube fragments remain bound to their neighbor even after being exposed to the electron beam, which raised them to temperatures sufficiently high to cause them to partially decompose. The cohesion of the nanotube fragments shown in Figure 5 of *Kiang*, in light of the intensity of the energy exposure they received substantiates that neither untangling nor any expectation of it is presented by *Kiang*. The examiner's assertion that "no difference is seen between the process of *Kiang et al.* and that of the instantly claimed invention" (Office Action at 2) appears misplaced. *Kiang* observed fragmentation of nanotubes as a result of heating by an intense electron beam, and the fragmented tubes remained aggregated. The present invention describes cutting nanotubes and recovering untangled nanotubes. These are different processes.

As to Claim 85, the Examiner's contention that sonication would be expected to cut nanotubes is not an expectation that one skilled in the art would reasonably have held at the time of *Kiang*. *Kiang* does not provide motivation for or expectation of success for cutting by sonication. Again, noting the power density of thousands of watts per square centimeter

used by *Kiang* to cut nanotubes, it is particularly un-obvious that sonication in which only 20 watts is applied over the base of a one-pint reservoir containing a suspension of nanotubes (Application at 31 *ll.* 20-22) would have the same (or any) cutting effect. The motivation of *Kiang's* sonication was *not* to cut or otherwise modify the nanotubes, but rather was as a step in preparation of the nanotubes for analysis by electron microscopy. *Kiang's* motivation was to view the nanotubes as-made in the arc process and to modify them by heating with an electron beam.

Claims 86-88 relate to the mean length of shortened single-wall carbon nanotubes and lengths of shortened single-wall carbon nanotube in the un-tangled material recovered in Claim 84. Examiner contends that "*Kiang* does not explicitly teach the lengths of the carbon nanotubes after sonication treatment...however, it is expected that at least some of the nanotubes have lengths within the claimed range." As to the Examiner's supposition that in *Kiang* "at least some of the nanotubes have lengths within the claimed range", there is simply no evidence regarding nanotube length in *Kiang*. As-produced nanotube length distributions vary from a few nanometers to hundreds of microns, and, as indicated above, there was no reasonable expectation in the context of *Kiang* that the length distribution would be modified by sonication. *Kiang* presents no information about the length distribution of nanotubes either before or immediately after sonication. Neither *Kiang*, nor any knowledge generally available at the time of *Kiang*, suggests or motivates the idea that nanotubes may be shortened or cut by sonication.

Kiang does not suggest untangling, recovering untangled material, or a mean length of shortened single-wall carbon nanotubes in recovered, untangled material.

Claims 89-90 and 92-94 all depend, either directly or indirectly, on Claim 84 and possess all of the limitations of Claim 84, and therefore, are similarly unobvious for reasons described for Claim 84 above, Furthermore, all include the additional step of forming a suspension of the tangled single-wall carbon nanotubes. *Kiang* neither teaches nor suggests forming a suspension of tangled single-wall carbon nanotubes—in addition to the limitations of Claim 84.

Amended Claims 97-99, as described above, include a step of "attacking the defects to cut...carbon nanotubes." There is no suggestion in *Kiang* that the nanotubes may be attacked at defects by the process disclosed. To the contrary, as noted above, Kiang speaks to "patching" and "repairing" defects by the process disclosed. There is no suggestion, motivation or reasonable expectation of success that attacking a carbon nanotube at a defect site would effect a cutting of the nanotube. Claim 99 has been amended to depend on Claim 98 which admits the step of reflux. *Kiang* does not suggest reflux as a method to cut nanotubes.

Regarding Claims 100-102, each depends on Claim 97 and each is unobvious for the same reasons as Claim 97. These Claims further add the step of introducing defects to the carbon nanotubes. Claim 102 includes introduction of defects by sonication.

Examiner contends that "[w]hile it is not explicitly taught [in *Kiang*] that the sonication may additionally cause defects, it is expected that this be the case, due to the forces that act upon the tubes during the sonication process." Office Action at 3. As to this expectation, we note that *Kiang* gives no information whatever about the volume or power of the sonication apparatus used or the length of time for which sonication was applied. The Examiner therefore cannot meaningfully suppose anything about the forces acting during the sonication of *Kiang*. As indicated in the Application, sonication for a certain duration and at a certain power is required to effect introduction of defects, the introduction of which is a first step in cutting. *Kiang* does not suggest or motivate damaging or cutting nanotubes via sonication and, at the time of *Kiang*, it was not generally believed that sonication was effective in damaging or cutting carbon nanotubes. Claim 103 is made redundant by the amendments to prior claims and is cancelled.

Accordingly, Applicant respectfully requests that the Examiner consider Applicant's amendments and arguments and withdraw all outstanding rejections under § 103 over *Kiang*.

IV. REJECTIONS UNDER 35 U.S.C. § 103(a) OVER *DE HEER* TAKEN WITH *SERAPHIN*

Examiner has rejected Claims 84-86, 89-90, 92-94 and 96 under 35 U.S.C. § 103(a) as being unpatentable over *de Heer et al.*, "Aligned Carbon nanotube Films: Production and Optical and Electronic Properties," Science, Vol. 268, pp. 845-847, 1995 ("*de Heer*") taken with *Seraphin, et al.*, "Single-walled carbon nanotubes produced at high yield by mixed catalysts", Applied Physics Letters, Vol. 64 (16), pp. 2087-2089, 1994 ("*Seraphin*"). Office Action at 4.

Examiner contends that "*De Heer et al.* teach a process for the production of thin films of aligned carbon nanotubes, comprising ultrasonically dispersing, or sonicating, nanotube samples in ethanol and drawing the suspension through a filter," and that "*Seraphin et al.* teach the production of tangled threads, or ropes, consisting of bundles of 5-15 single-walled nanotubes." Examiner further contends that "[i]t would have been obvious to one of ordinary skill at the time of invention to perform the process of *de Heer et al.* on the nanotube samples of *Seraphin et al.* in order to form thin films of aligned carbon nanotubes." Examiner also contends that "[i]t is not explicitly taught that the nanotubes are cut and untangled, however, it is expected that this occur because no difference is seen between the process of *de Heer et al.* and that of the instantly claimed invention." Office Action at 4.

With regard to Claims 84 and its dependent claims 85, 86, 89-90, 92-94, and 96 Applicant submits that the prior art references of *Seraphin* and *de Heer,* taken either alone or together, do not support a *prima facie* case of obviousness as they do not teach or suggest the cutting of single-wall carbon nanotubes so as to un-tangle at least some of these nanotubes. Neither do they, alone or in combination, teach or suggest recovering a material comprising single-wall carbon nanotubes un-tangled by cutting. Just as in *Kiang*, *de Heer* uses sonication to disperse nanotube-containing material for further processing. *de Heer* neither mentions nor suggests cutting of the nanotubes nor does *de Heer* disclose the sonication energy or duration required to effect cutting. It is therefore not inherent or obvious that *de Heer* effected cutting and un-tangling as claimed in the present Application. For this reason, Applicant respectfully requests that Examiner withdraw the rejection of Claims 84-86, 89-90,

92-94, and 96 as unpatentable under 35 U.S.C. §103(a) as obvious over *de Heer* taken with *Seraphin*..

As to the Examiner's suggestion regarding Claims 97-99 [in light of *Seraphin*] "there is no difference between the process of *de Heer et al.* and that of the instantly claimed invention" (Office Action at 5), Applicant notes that amended Claims 97-99 deal expressly with attacking nanotubes at defects to effect their cutting. Neither *de Heer* nor *Seraphin* speak to or suggest cutting nanotubes, nor do either of them address the notion of defects in the nanotubes. For this reason, Applicant respectfully requests that Examiner withdraw the rejection of Claims 97-99 as unpatentable under 35 U.S.C. §103(a) as obvious over *de Heer* taken with *Seraphin.*

V. REJECTIONS UNDER 35 U.S.C. § 103(a) OVER *HIURA* TAKEN WITH *SERAPHIN*

Examiner has rejected Claims 84-86, 89, 91-93, 96-99 and 109-113 under 35 U.S.C. § 103(a) as unpatentable over *Hiura et al.*, US Patent 5,698,175, ("*Hiura*") taken with *Seraphin.* Office Action at 4.

Examiner contends that "*Hiura* teaches a process for the purification and uncapping of carbon nanotubes, comprising treating the nanotube sample with an aqueous solution including a reaction reagent, for example nitric acid. The process comprises dispersing the nanotubes with ultrasonic into the reaction solution and refluxing at a temperature of 120-180°C to provide oxidative etching. The nanotubes are then filtered and for recovery." Office Action at 4-5. Examiner also contends that "*Seraphin et al.* teach the production of tangled threads, or ropes, consisting of bundles of 5-15 single-walled nanotubes." Office Action at 5. Examiner further contends that "It would have been obvious to one of ordinary skill at the time of invention to perform the process of *Hiura* on the nanotube samples of *Seraphin et al.* in order to purify and uncap the carbon nanotubes."

Additionally, Examiner notes that "[r]egarding claims 84-86, 89, 91-93 and 96-99, it is not explicitly taught that the nanotubes are cut and untangled, however, it is expected that

this occur because no difference is seen between the process of *de Heer, et al.* and that of the instantly claimed invention."

As a preliminary point, Applicant submits that there are fundamental differences between the process of *de Heer* and that of the instantly claimed invention. These differences have been presented above.

Claim 84. Regarding Claim 84, there is no suggestion in *Hiura* taken with *Seraphin* as to provide a method for untangling single-wall carbon nanotubes. There is also no suggestion in these references to cut single-wall carbon nanotubes by any method cited in Claim 84, or to recover cut, untangled nanotubes as is set forth in Claim 84. The process of *Hiura* taken with *Seraphin* thus do not teach or suggest all the limitations of Claim 84 and a *prima facie* case of obviousness has not been established.

Claims 85, 86, 89, 91-93 and 96. Regarding Claims 85, 86, 89, 91-93 and 96, these claims are dependent on Claim 84, as amended, and, possessing all the elements required of Claim 84, are therefore not obvious for reasons similar to those stated above for Claim 84.

Claim 97-99. Regarding Claim 97, there is no suggestion in *Hiura* taken with *Seraphin* as to provide a method for cutting single-wall carbon nanotubes by any method cited in Claim 97, which speaks to attacking the defects in carbon nanotubes to effect their cutting. The process of *Hiura* taken with *Seraphin* also does not teach or suggest all the limitations of Claim 97. Thus, a *prima facie* case of obviousness has not been established. Likewise, a *prima facie* case of obviousness has not been established for Claims 98 and 99, which are dependent on Claim 97 for reasons similar to those presented for Claim 97.

Claim 109. Regarding Claim 109, there is no suggestion in *Hiura* taken with *Seraphin* to provide a method for modifying single-wall carbon nanotubes by the step of removing a fullerene cap on at least one end of the single-wall carbon nanotubes. *Hiura* taken with *Seraphin* neither teach nor suggest all the limitations of Claim 109 and in particular, the step of "removing a fullerene cap on at least one end of the single-wall carbon nanotubes" is neither taught nor suggested. Thus, a *prima facie* case of obviousness has not been established.

Claims 110-113. Regarding Claims 110-113, these claims are dependent on Claim 109, and, possessing all of the limitations of that claim, are not obvious for reasons similar to those stated above for Claim 109.

Accordingly, Applicant respectfully requests that Examiner withdraw the rejection of Claims 84-86, 89, 91-93, 96-99 and 109-113 as unpatentable under 35 U.S.C. §103(a) over *Hiura* taken with *Seraphin.*

VI. REJECTION UNDER 35 U.S.C. § 103(a) OVER *KIANG* TAKEN WITH *HOWARD*

Examiner has rejected Claim 95 under 35 U.S.C. § 103(a) as being unpatentable over *Kiang et al.*, as applied to Claims 84 and 93-94 above, and further in view of *Howard et al.,* US Patent 5,598,232, ("*Howard*").

Examiner contends that "*Kiang* teaches the sonication of the nanotube soot samples in ethanol, with the deposition of drops on a carbon grid for analysis. *Howard* teaches the production of soot containing nanotubes, including single-walled nanotubes, in a burner chamber. The soot is dispersed by sonication in an organic solvent, such as toluene, and drops of the suspension are placed on a carbon grid for analysis." Examiner contends "It would have been obvious to one of ordinary skill at the time of invention to substitute toluene, as taught by *Howard et al.,* for the ethanol of *Kiang et al.,* as it is seen to have an equivalent effect." Office Action at 5.

Examiner further contends that "Additionally, *Howard* teaches the process of soxhlet extraction to extract fullerene structures. Official notice is taken that soxhlet extraction uses organic solvents, such as benzene, toluene, or xylene. It would have been obvious to one of ordinary skill at the time of invention to perform soxhlet extraction, as taught by *Howard et al.,* on the nanotube samples of *Kiang et al.*, in order to extract various fullerene structures." Office Action at 6.

Claim 95. Claim 95 depends indirectly from Claim 84, and, possessing all of the limitations of Claim 84, is therefore not obvious for reasons similar to those stated above for Claim 84. Applicant points out that Soxhlet extractions are used to extract small molecule

fullerenes, e.g., C_{60}, C_{70}, etc., not macromolecular fullerenes like single-wall carbon nanotubes whose solubility in such solvents is orders of magnitude lower. Additionally, Applicant contends that ethanol and toluene possess such different solvent properties (one being polar, the other not), that it would not in any way be obvious to try the toluene of *Howard* in lieu of the ethanol of *Kiang*—irrespective of the differences between the present invention and *Kiang*.

Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of Claim 95 as unpatentable under 35 U.S.C. §103(a) over *Kiang* taken with *Howard*.

VII. AMENDMENTS TO THE DRAWINGS

The present application and United States Patent Application Serial No. 10/027,568, filed December 21, 2001 ("the '568 Patent Application") are both divisional patent applications of the United States Patent Application Serial No. 10/000,746, filed November 30, 2001, all of which applications are commonly assigned. On October 7, 2002, a Notice of Allowance was transmitted to Applicant for the '568 Patent Application; and Applicant paid the issue fee on October 16, 2002. Subsequently, on March 20, 2003, Applicant received a Notice Regarding Drawings for the '568 Patent Application. Specifically, the Draftperson's review objected to the drawings for Figures 2A-C, 4A-D, 6, and 7A-B for the following reasons set forth on PTO Form 948, which was attached to the Notice Regarding Drawings for the '568 Patent Application. These were:

(a) Under 37 C.F.R. § 1.84(i), for Figures 2A-C, 4A-D, 6, and 7A-B, "[l]ines, numbers & letters not uniformly thick and well defined, clean, durable, and black (poor line quality)."

(b) Under 37 C.F.R. § 1.84(m), for Figures 2A-C, 4A-D, 6, and 7A-B, "[s]olid black shading not permitted."

(c) 37 C.F.R. § 1.84(p), for Figures 4A-D, 6, and 7A-B, "[n]umbers and reference characters not plain and legible."

On May 19, 2003, Applicant filed its Response to Notice Regarding Drawings in the '568 Patent Application. In this response, Applicant replaced new drawing sheets 3/14, 6/14, 8/14, 9/14 and 10/14 for the original sheets. These sheets include more legible Figures 2A-2C, 4A- 4D and 6 – 7B as requested by the Draftsperson. in the Notice Regarding Drawings for the '568 Patent Application.

As the present Application contains these same drawings, Applicant is submitting these improved figures in the present Application. Pursuant to 37 C.F.R. 1.84(b), the improved figures are submitted as photographs, as this is the only practicable medium for illustrating these figures.

Applicant has amended the drawings to facilitate prosecution of the present Application; Applicant believes by doing so, this will obviate this potential issue with the figures.

VIII. AMENDMENTS TO THE SPECIFICATION

After Applicant filed its Response to Notice Regarding Drawings in the '568 Patent Application, Applicant received a Notice of Drawing Inconsistency with Specification in the '568 Patent Application, dated June 2, 2003. In this Notice, Applicant was informed that the USPTO had received the improved figures (which presumably were accepted by the draftsperson) but the USPTO had now identified an inconsistency between the drawings and the Brief Description of Drawings in the '568 Patent Application. These were: The Brief Description referred to Figures 3A-3B and 5A-5B while the drawings contained Figures 3A-3C and 5A-5C. On June 30, 2003, Applicant filed its Amendment in Response to Notice of Drawing Inconsistency with Specification in the '568 Patent Application. In that amendment, Applicant amended the Brief Description of Drawings and the Detailed Description of the Invention, in the identical manner as presented on page 2 above.

Because this same issue exists in the present Application, Applicant is amending the specification in the same manner as they did in the '568 Patent Application. Accordingly, in the specification, the paragraphs within the Brief Description of Drawings have been

amended to correctly identify the drawings. In the Detailed Description of the Invention of the Specification, the amendment of the paragraph beginning at page 18, *l.* 11, was made to harmonize the written description and the drawings. No new matter is added by these amendments to the specification.

The Applicant believes this amendment reconciles the inconsistency between the drawing and the Brief Description of the Drawing. Again, Applicant is amending the specification to facilitate prosecution of the present Application. Applicant believes by doing so, this will obviate this potential issue between the drawings and the specification.

IX. CONCLUSION

As a result of the foregoing, it is asserted by Applicant that the Claims in the Application are now in a condition for allowance, and respectfully request allowance of such Claims.

Applicant respectfully requests that the Examiner call Applicant's attorney at the below listed number if the Examiner believes that such a discussion would be helpful in resolving any remaining problems.

Respectfully submitted,

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